

### **REMARKS**

Claims 2, 4, 8 and 10 are pending in the application. Claims 4, 8, and 10 are withdrawn. Claim 2 has been amended to correct a typographical error. Claim 2 is rejected.

The issues outstanding in this application are as follows:

- Claim 2 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Bayon et al. (Preparation of Indium Hydroxy Sulfide  $\text{In}_x(\text{OH})_y\text{S}_z$  Thin Films by Chemical Bath Deposition) in view of Birkmire (U.S. Patent No. 5,674,555) and Nakada et al. (High-Efficiency Cadmium-free  $\text{Cu}(\text{In,Ga})\text{Se}_2$  Thin-Film Solar Cells with Chemically Deposited ZnS Buffer Layers).

#### **I. Claim 2; 35 U.S.C. § 103(a)**

Claim 2 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Bayon et al. (Preparation of Indium Hydroxy Sulfide  $\text{In}_x(\text{OH})_y\text{S}_z$  Thin Films by Chemical Bath Deposition) in view of Birkmire (U.S. Patent No. 5,674,555) and Nakada et al. (High-Efficiency Cadmium-free  $\text{Cu}(\text{In,Ga})\text{Se}_2$  Thin-Film Solar Cells with Chemically Deposited ZnS Buffer Layers). The Applicants respectfully traverse.

*Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), controls the consideration and determination of obviousness under 35 U.S.C. 103(a); *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1734-35, 167 L. Ed. 2d 705, 715 (U.S. 2007). The four factual inquiries enunciated therein for determining obviousness are: (1) determining the scope and contents of the prior art; (2) ascertaining the differences between the prior art and the claims in issue; (3) resolving the level of ordinary skill in the pertinent art; and (4) evaluating evidence of secondary considerations.

In order to assess the scope and content of the prior art properly, a thorough understanding of the invention must be acquired by studying Applicants' claims and the specification. M.P.E.P. § 2141. Thus, the inquiry begins with construction of Applicants' claims, in which the claims as presented herein are relied upon. Next, when ascertaining the differences between the prior art and the claims at issue, both the invention and the prior art

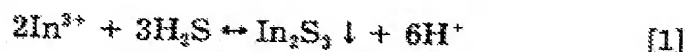
references as a whole must be considered, and *all* claim limitations must be considered when determining patentability of Applicants invention. M.P.E.P. §§ 2141; 2143. When this is properly done in this case, as shown below, it becomes clear that differences exist that preclude obviousness. And finally, the test for obviousness requires identification of a reasonable basis for combining the claimed elements in the claimed fashion. *KSR*, 127 S. Ct. at 1741; M.P.E.P. §2143. As shown below, this requirement is not met in this case, and no *prima facie* case for obviousness is made.

**A. Differences with respect to pH**

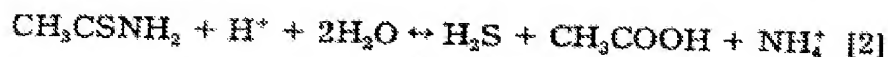
As the Examiner points out on page 3 of the Action, a *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. However, this standard is not applicable to the present situation. As explained in the Bayon reference:

## Results and Discussion

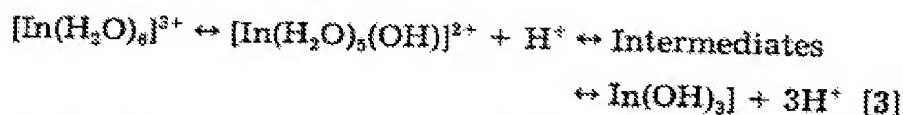
A bright yellow indium(III) sulfide precipitate can be obtained by reaction of hydrogen sulfide with an indium(III) salt in a weakly acidic solution (usually acetic acid medium)<sup>14</sup>



Hydrogen sulfide can be provided by the acid catalyzed thioacetamide hydrolysis at high temperature<sup>15</sup> according to the reaction



However, the process is not so simple because there are some other reactions that must be taken into account, for example, hydrolysis reactions of In(III) ion when the pH of aqueous solution becomes higher than 3. Intermediate species are believed to form as hydrolysis proceeds, with In(OH)<sub>3</sub> as the final product<sup>16-18</sup>



In addition, if acetic acid is added to the solution, not only will it be involved in the last reactions, but also some indium(III) acetate complexes can be formed,<sup>19,20</sup> changing the precipitation reaction paths. Thus, the precipitate composition is not well defined and a nonstoichiometric indium(III) hydroxy sulfide is believed to be formed.

Thin films based in this compound have been prepared by varying the deposition time in a solution of 0.025 M

As explained in the passage above, a change in pH generates a different final product. For example, a pH less than three gives the acid catalyzed product In<sub>2</sub>S<sub>3</sub>, and a pH higher than 3 gives the hydrolysis product In(OH)<sub>3</sub>. As the pH changes the product changes. Different products have different properties. As stated above, prior art ranges that do not overlap but are close enough that one skilled in the art would have expected them to have the **same properties are obvious.**

Assuming that the skilled artisan would have taken a high school chemistry course or a college level general chemistry course, the skilled artisan would readily recognize that the properties of a solution with a pH of less than 7 would be different from the properties of a solution with a pH of more than 7. For the examiner to maintain this position, the Examiner

would be asserting that acid and basis are the same and there is no need for distinguishing the two.

Also, claim 2 recites four steps that are dependent upon pH. The buffer layer is formed in four steps. All four recite pH limitations. In forming the first step layer and in depositing the second step layer, the pH is regulated to a value between 1 to 3.5. In forming the third step layer, the pH is regulated to a value between 3.5 to 12. Nowhere does Bayon or any other cited reference teach forming a buffer layer that further comprise four step layers or teach wherein the first two steps layers has a regulated pH value between 1 to 3.5, the third step layer has a regulated pH value between 3.5 and 12, and the fourth step layer has a unregulated pH value.

#### **B. Differences with respect to temperature**

As the Examiner states on page 4 of the Action, Bayon is silent with respect to regulation of the temperature of the solution during the formation of the buffer layer. The Nakada reference does not cure this defect. Aside from the fact that none of the cited references teaches a four step process for forming the buffer layer, the Examiner's assertion that Nakada teaches a first preset temperature (room temperature) for a first preset time; a second preset temperature for a second preset time; and a third preset temperature for a third preset time is fundamentally flawed. Nakada teaches the aqueous CBD solution's temperature rising from room temperature to 80 degrees Celsius. The Examiner accounts for a first, second and third preset temperature through the following logic "During this temperature rise, there will be an intermediate temperature reached at some time that will be higher than the first temperature. The time at which the CBD begins reads on the instant first preset time...." Following this logic there are an infinite number of temperatures between room temperature and 80 degrees Celsius. As the temperature rises, for every one hundredth of a second there will be a different preset temperature. Clearly, the skilled artisan would not read Nakada and deduce that there are three arbitrarily preset temperatures in instructions that state increase the temperature of the solution from room temperature to 80 degrees Celsius. The fundamental flaw is found in the term "preset." For example, what is the "preset" temperature in Nakada?

**C. Differences with respect to the Buffer layer**

None of the cited references teach forming a buffer layer further comprising the steps of:

- (1) forming a first step layer by deposition being rich in InS followed by;
- (2) forming a second step layer by deposition being rich in InS followed by;
- (3) forming a third step layer by deposition being rich in InOH-InO followed by;
- (4) forming a fourth step layer by deposition by repeating steps 1-3 by not regulating the temperature or pH in the fourth step.

Assuming that the references can be combined without substantial reconstruction and redesign or assuming that the references can be combined in such a way that would not render any of the references inoperable for its intended purpose, the resulting buffer layer as claimed will have a different compositional makeup from any of the cited references.

In summary, the combination of Bayon et al. (Preparation of Indium Hydroxy Sulfide  $\text{In}_x(\text{OH})_y\text{S}_z$  Thin Films by Chemical Bath Deposition) in view of Birkmire (U.S. Patent No. 5,674,555) and Nakeda et al. (High-Efficiency Cadmium-free  $\text{Cu}(\text{In,Ga})\text{Se}_2$  Thin-Film Solar Cells with Chemically Deposited ZnS Buffer Layers) do not teach all claim limitations; therefore, no *prima facie* case of obviousness has been made.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the outstanding rejection of claim 2 under 35 U.S.C. § 103(a) as being unpatentable over Bayon et al. (Preparation of Indium Hydroxy Sulfide  $\text{In}_x(\text{OH})_y\text{S}_z$  Thin Films by Chemical Bath Deposition) in view of Birkmire (U.S. Patent No. 5,674,555) and Nakeda et al. (High-Efficiency Cadmium-free  $\text{Cu}(\text{In,Ga})\text{Se}_2$  Thin-Film Solar Cells with Chemically Deposited ZnS Buffer Layers).

## **II. Conclusion**

In view of the above, applicant believes the pending application is in condition for allowance.

The fee for a Request for Continued Examination (RCE) under 37 C.F.R. § 1.114 is being submitted with this response. However, The Commissioner is hereby authorized during prosecution of this application to charge any fees that may be required (except for patent issue fees required under 37 CFR §1.18) or to credit any overpayment of fees to Deposit Account No. 50-0337. If an extension of time is required in connection with this paper, please consider this a Petition therefore and charge any fees required to Deposit Account No. 50-0337.

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Respectfully submitted,

By /Leslie Streeter/  
Leslie Streeter  
Registration No.: 63,221  
FULBRIGHT & JAWORSKI L.L.P.  
Fulbright Tower  
1301 McKinney, Suite 5100  
Houston, Texas 77010-3095  
(713) 651-5151  
(713) 651-5246 (Fax)  
Agent for Applicant